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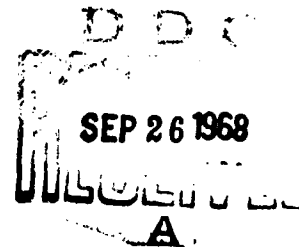
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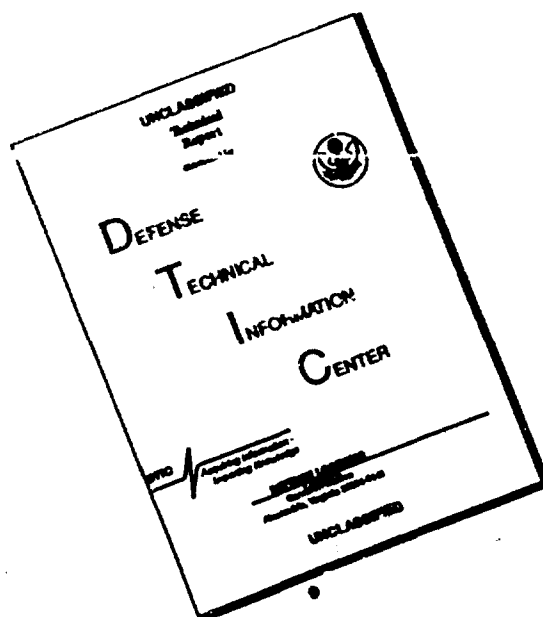


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1322
(In full)
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O SUSHCHNOSTI IMMUNITETA PRI SIBIRSKOI IAZVE
O znachenii vegetativnoi nervnoi systemy
v infektsii i immunitete
SOOBHCHENIE IV

ON THE NATURE OF IMMUNITY IN ANTHRAX
On the significance of the
vegetative nervous system in
the infection and immunity
COMMUNICATION IV

Veterinariia 28 (5):36-38. May. 1951

(In Russian)

ON THE NATURE OF IMMUNITY IN ANTHRAX
On the significance of the vegetative nervous system in the infection and immunity

COMMUNICATION IV*

In the practice of specific prophylaxis against anthrax and in other infections it has not been possible to obtain a 100% immunity in the vaccinated animals. The same is observed also in medical practice. Thus, P.F. Zdrodovskii, active member of the Academy of Medical Sciences, points out that there are group of men who yield with difficulty to the immunization, whom he refers to the so-called "refractory" contingents.

In our experiments with the vaccination with formol-vaccines against anthrax we obtained immunity on the average in 75% of the vaccinated rabbits and 50-55% of white mice and guinea pigs. As a rule we never succeeded in obtaining 100% immunity in the vaccinated rabbits even from the TSENKOVSKII II vaccine.

Taking into account the data of academician A.D. Speranskii's school concerning the role of the nervous system in infection and in the defensive reactions of a

*Communication I - Veterinariia, 10-11 1945. Communication II - Veterinariia 4, 1947. Communication III - Veterinariia 9, 1949.

complex organism. we conducted the corresponding investigations and established that the nervous system is of exceptional significance in the infection and immunity in anthrax.

Thus in infliction of a trauma (biopsy of the ears) in the infection of the rabbits which had been immunized against anthrax, "removes" their immune status and the rabbits die equally as the controls. It had been experimentally proved also that the rabbits, immunized against anthrax, die from anthracic sepsis when they receive atropine before the infection.

These experiments pointed to the fact that the immunity in animals toward anthrax is closely bound with the tonus of the vegetative nervous system.

With respect to the significance of the role of vegetative nervous system in immunity, many investigators agree that in the use of the substances which stimulate the work of the vagus there is observed an increase in the number of antibodies and a reduction in the phagocytic capacity of leukocytes, and, conversely, in the introduction of the substances which stimulate the sympathetic nervous system there is observed a reduction in the number of antibodies and an increase in the phagocytic capacity of leukocytes. As the investigations of P.V. Puchkov (1946) showed, the action of the mediators in the organism is analogous.

These data represent a considerable interest and are extremely valuable for the understanding of the nature of immunity and pathogenesis in infectious diseases.

Our experimental investigations which had been cited in the previous communications, as well as the available literary data permit the statement that agent of anthrax, penetrating into the organism, affects the nervous equilibrium of the latter quickly, and it exerts its pathogenic action first of all apparently on the sympathetic nervous system. Thus, for example, the histological examinations in the anthrax, both in the cases of infection and in immunization, reveal morphological changes in the sympathetic ganglia and adrenals.

In working with vegetative poisons we observed a rather interesting phenomenon. In introducing adrenalin in 0.2cc dose (1:1,000) subcutaneously into rabbits, a sharp contraction of the vessels develops immediately after the injection of adrenalin; moreover, in the majority of rabbits this passes away relatively fast and there remains no visible reaction. But in a very negligible percent of rabbits we observed at the place of injection a reaction in form of a firm white spot with hemorrhage also along the periphery, with subsequent necrosis of the section of introduction of adrenalin and the formation of sores. These rabbits differed in nothing externally from other rabbits, but in the experimental vaccination against anthrax they as a rule died in the control infection, which may be judged by table I.

It is seen from this table that of the 5 rabbits, reacting to the injection of adrenalin, 4 died in the control infection and 1, in which the reaction to adrenalin was weaker, survived. The rabbits which did not react to adrenalin had a stable immunity as a result of the vaccination and survived.

We did not find reports in the literature which would correspond to our findings. There is a report of Shimanovskii and Shukailo (Sovetskaya meditsina, 3, 1948) which points out that in one person sick with brucellosis, on the section of the skin where the Biurne [transliterated] reaction was set up previously, in the subsequent injection of adrenalin into another place there were observed hemorrhages and a bluish-reddish purple coloring of the skin of the entire area which was earlier occupied by the reaction. The authors observed in this sick [person?] a sharp sympathicotonic reaction.

This case cannot of course be compared with our data, but it gave us the basis to refer the rabbits reacting to adrenalin to the sympathicotonics, more probably - to the hypersympathicotonics.

Proceeding from such hypothesis we set up experiments on rabbits for the purposes of drawing the sympathetic nervous system into the post-vaccinal process. To this end, one group of rabbits received the Tsenkovskii II vaccine in 0.3cc dose in the area of the upper cervical sympathetic ganglion, and the second group - the same dose, subcutaneously.

The results of these experiments are given in Table II.

In the dead rabbits, from the place of injection of the vaccine to the sub-sternal region there was a considerable gelatinous infiltrate which is typical for anthrax; from the blood of the heart was isolated the original culture of the II vaccine.

As is known, the virulence of the Tsinkovskii II vaccine is controlled on rabbits, and in injection of even more considerable doses than 0.3cc the cases of death are very rarely observed. In the experiments in which the II vaccine was injected into the area of the upper cervical sympathetic ganglion the loss of rabbits was observed in virtually all cases, while the rabbits which received the same dose subcutaneously survived. Therefore the implication of the upper cervical sympathetic ganglion into the vaccinal process sharply changes the course of the post-vaccinal reaction to the Tsenkovskii II vaccine.

As a result of the data obtained, before us arose the question - how will the reaction proceed if the tonus of the vegetative nervous system in the rabbits is changed after the vaccination. One group of rabbits received, subcutaneously, the Tsenkovskii II vaccine and atropine on the day of vaccination and in the subsequent two days. The other group received only the Tsenkovskii II vaccine, subcutaneously.

The results of these experiments are given in Table III.

As is seen from that table, out of the 7 rabbits which received atropine, 5 died from the II vaccine, while the rabbits which did not receive atropine survived.

From these experiments it is evident that:

1. The rabbits giving local reaction to the subcutaneous injection of adrenalin, in inoculation with the Tsenkovskii II vaccine do not yield to immunization and in the control infection die equally as the controls.
2. In the implication of the upper cervical sympathetic ganglion into the post-vaccinal process (injection of the II vaccine into this area) the anthracic sepsis develops and the rabbits die from vaccinal anthrax.
3. In the rabbits, inoculated subcutaneously with the Tsenkovskii II vaccine and then receiving atropine 3 days in succession, the anthracic sepsis also develops and they die from vaccinal anthrax.

Proceeding from our experimental data, it may be granted that the sympathetic nervous system is of important significance in the infection and immunity in anthrax. It is admissible that in vaccination against anthrax the immunizing effect will be had in ~~that case~~ when the sympathetic nervous system, adapting the organism to the changed conditions of environment, shall be drawn into the vaccinal process. It is admissible also that the post-vaccinal complications in inoculations against anthrax have a close association with ~~the status~~ of the tonus of vegetative nervous system in the animals before their vaccination.

Our experimental data permit also the assumption that the so-called "refractoriness" in the immunization of men and animals associated with the status of the tonus of the vegetative nervous system.

The investigations of these problems in a broader scope will help to decipher the nature of infection and immunity not only in anthrax but also in other infectious diseases, and to work out more rational and effective methods of vaccination.

LL/rbp

TABLE I

Rabbit No.	Reaction to adrenalin	Vaccine and dose	Control or died after how many hours
2841	Hemorrhage at the place of injection; skin necrosis; sore	June 30; Tsenkovskii II vaccine; 0.2cc subcutaneously	72
2842			120
2843		"	36
2840	No reaction	"	Lived
2839	"	"	48
2843	"	"	Lived
3195	Control	"	48
3196	"	"	36
3084	Hemorrhage; necrosis; sore	July 9 and July 16-formol-vaccine vs. anthrax	48
3094	Hemorrhage; no necroses		Lived
3092	No reaction	July 9 and July 16-formol-vaccine against anthrax	"
3093	"		"
3095	"	"	"
3096	"	"	"
3099	"	"	"
3100	"	"	"
3097	Control		60
3098	"		48

TABLE II

Rabbit No.	Method of introduction of vaccine	Result
<u>November 16</u>		
3175	Tsenkovskii II vaccine, 0.3cc into the area of the upper cervical sympathetic ganglion	Died after 8 days
3174		" " 6 "
3173	Ditto	" " 5 "
7290	"	" " 6 "
1070	"	" " 4 "
1056	"	" " 5 "
1057	"	" " 3 "
1054	"	" " 5 "
3180	Tsenkovskii II vaccine	Lived
3181	0.3cc subcutaneously	"
3182	0.3cc subcutaneously	"
3183	0.3cc subcutaneously	"
<u>November 26</u>		
2966	Tsenkovskii II vaccine, 0.3cc into the area of the upper cervical sympathetic Ganglion	Died after 3 days
2965		" " 5 "
2969	Ditto	Lived
2962	"	Died after 3 days
2960	"	" " 4.5 "
2959	"	" " 5 "
2964	Tsenkovskii II vaccine	Lived
2963	0.3cc subcutaneously	"
2961	0.3cc subcutaneously	"

TABLE III

Rabbit No.	Vaccine and dose	Supplementary force	Result
<u>December 7</u>			
2070	Tsenkovskii II	Atropine, subcutaneously	Died after 120 hrs.
2967	vaccine, subcutaneous, 0.3cc dose	" "	" " 96 "
2951	"	" "	" " 84 "
2952	"	" "	Lived
2964	"	Without supplementary force	"
2963	"	"	"
<u>December 18</u>			
2953	Tsenkovskii II	Atropine, subcutaneously	Died after 96 hrs.
2954	Vaccine, subcutaneously, 0.3cc	" "	Lived
2968	"	" "	Died after 140 hrs
2955	"	Without supplementary force	Lived
2956	"	"	"
2957	"	"	"